A Top-down attentional system scanning multiple targets with saccades

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HAL Id: inria-00166538

https://hal.inria.fr/inria-00166538

Submitted on 7 Aug 2007

# A Top-down attentional system scanning multiple targets with saccades

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We would like to introduce recent developments in the computational cognitive neuroscience domain, applied to computer vision. Our objective in this paper is to propose a biologicially inspired algorithm to solve a computer vision problem that is to focus (by the mean of eye movements or camera movements) on several targets that share given properties. This algorithm relies on the paradigm of distributed, asynchronous and numerical computations that we think could lead to efficient algorithms in the long run.

From the cognitive neuroscience point of view, it relies on several physiological principles : the feature integration theory proposed in [1] and the separation of feature and spatial processing proposed in [2]. Our approach is also based on two previous works. In [3], the author proposed a neural network architecture which aims at simulating the visual attentional phenoma (for details about that phenoma, please refer to [4]). In [5], we proposed a mechanism that allows a robot to successively focus on several stimuli. By *focus on* we mean performing an eye movement centering a target on the camera's retina. In the figure below, the combination of these two previous models leads to a computational model that is able to focus on several targets, that share given properties (defined in the **target** maps), memorizing the previously scanned objects in a **working memory**. An interesting property of this model is that the decision of which target to focus on next is completely distributed; it depends both on the properties of the target and on the prevLiously focused ones.

We are conscious that, for the moment, it is quite difficult to make such a model work in real world applications for several reasons (the parameters of the equations must be adjusted, the proposed architecture is quite simple); It is designed for simplified world but it must be emphasized that the architecture is quite simple too and adding, step by step, the features it lacks, should make it more efficient.
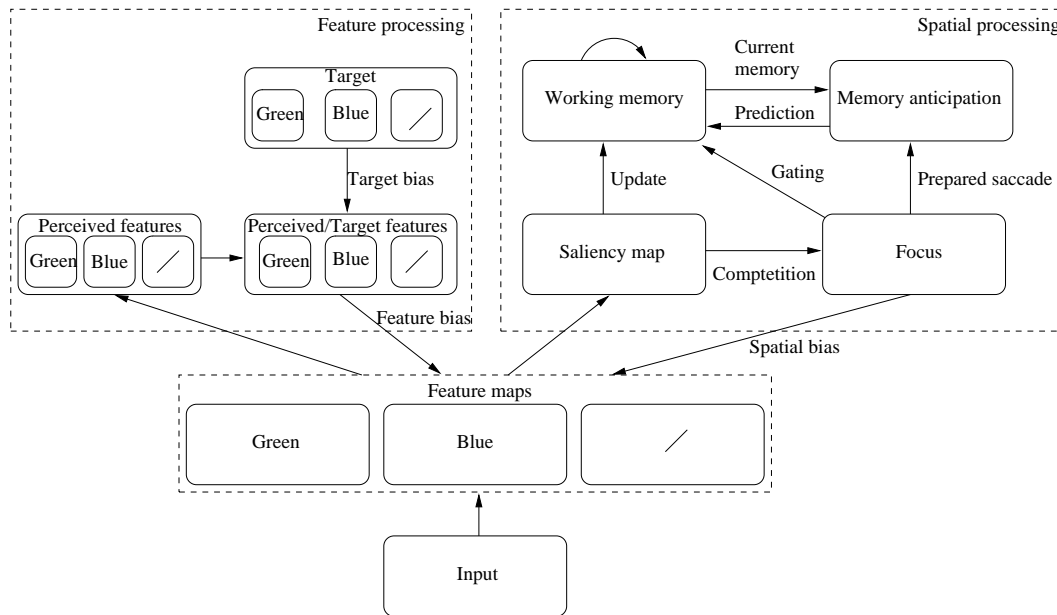
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